144

SCIENCE

ELEVENTH YEAR.
VOL. XXI. No. 530.

MARCH 31, 1893.

SINGLE CO[illegible]EN CENTS.
$3.50 PER YEAR, IN ADVANCE.

CONTENTS.

Entered at the Post-Office of New York, N.Y., as Second-Class Mail Matter.

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

First inserted June 19, 1891. No response to date.

N. D. C. HODGES, 874 BROADWAY, N. Y.

SCIENCE

NEW YORK, MARCH 31, 1893.

ON THE ETHNOLOGICAL CHARACTERISTICS OF THE HUMAN NASAL CANALS, CONSIDERED AS AN ECONOMIC ADAPTATION.

BY WILLIAM C. BRAISLIN, M.D., BROOKLYN, N.Y.

THE human voice bears a constant relation to the physical construction of the voice-producing organs.

Deep, manly tones are the constant sequelæ to a larynx of large proportions, to long and slowly vibrating vocal cords; while the childish treble and the high-pitched voice of the female are the natural productions of the smaller larynx with its shorter, and, consequently, more rapidly vibrating, vocal cords.

Of equal importance in the modulation, tone, and indefinable individual peculiarity of the voice, is the construction of the nose and pharynx. The anatomical construction of these organs is as varying as is that of the facial features, and, to the trained eye, the individual peculiarities are as apparent.

It is not to be wondered at, therefore, that the racial peculiarities, in regard to the anatomical structures, of the internal nares are particularly striking.

The external anatomical construction of the nasal organ characteristic of the native African, is as distinguishing an ethnological differentiation as are the color of his skin, the texture of his hair, and the development of his brain.

Corresponding distinctions characterize the *internal* structure of this portion of the upper air tract of this race. Immediately on passing the anterior openings of the nares, the human nasal canals spread out into deeper and wider channels. These cavities, separated by the *septum narium*, are corrugated on their opposite surfaces by the three pairs of turbinated bodies, whose "curled-leaf" surfaces increase enormously the extent of surface area of the nasal mucous membrane.

The bones of the cranium taking part in the formation of the nasal cavities, so differ in the African race as to make these canals wider, shorter, and less deep than those of other races. The bony ridges coursing their long axes, known as the turbinated bones, are also more blunt and less prominent and have less of the "curled-leaf" character.

Measurements of a single specimen of an average skull of either race will suffice to show this difference in bony framework.

	Negro.	White.
	Centimetres.	Centimetres.
Width of anterior nasal canals	2.7	2.5
Height of anterior nasal canals	2.6	3.5
Length of nasal canals (from anterior nasal spine to posterior nasal spine)	5.2	5.3
Length of nasal canals (from anterior nasal spine to posterior-superior angle of vomer)	7.0	7.2
Length of skull	19.0	19.0
Breadth of skull	14.0	14.0

The continuance of these peculiarities in the lineal descendants of the negro race as seen in America to-day, is markedly striking to the student of the comparative anatomy of this region.

One, indeed, cannot fail to note in any of the clinics devoted to the diseases of this region the increased advantage which accrues to the possessor of the wider nasal canals when pathological conditions, resulting in thickening of the lining mucous membrane, attack this portion of the anatomy.

One of the most prominent American larynxologists was enabled, by means of the more patent condition of the nasal canals in his negro patients,[1]— the American descendants of this race,— to make a contribution of certain facts to medical science, not otherwise easily obtainable.

Mr. Wallace[2] supposes that the origin of the African race was due to a migration of some part of the race of ancestral man from the great Euro-Asiatic plateau, and that his present characteristics are the result of physiological modifications due to climatic influence.

If we accept this likely explanation in regard to the special anatomical construction of the nasal cavities of the negro and his descendants, our logical conclusion is that they must present characteristics specially adapted for preparing the inspired air of a tropical climate for reception into the lung structures. We must suppose that ages of contact of his nasal mucous membrane with the atmosphere of a tropical climate have brought about, by the laws of natural selection, a nasal construction the most nearly adapted to dealing with the problem of the irritating qualities of a tropical atmosphere, of any existing race.

It does not seem probable that the evolution of the construction of the nasal canals, characteristic of the African type, has been due to any reason of better serving the purposes of the gustatory sense. The custom of regarding the nose as the organ of smell has, very properly, become modified to that of regarding it as primarily an organ of respiration. It is the proper channel for the conduction of air to the lungs for purposes of oxidation.

As has been stated, the means of warming, of moistening, and of freeing the air from dust and other irritating qualities are here most admirably afforded. The *sense of smell* must, indeed, also be regarded as a protective provision for the avoidance of substances irritating to the more delicate lung substance.

Had its purposes demanded an assistance to the procuring of food or to the avoidance of poisonous food, a development of the gustatory sense, such as is found in the dog or other animals, would have been found in the human species. This, however, is not the case. The acute sense of smell is not one highly developed or inherent in man. Indeed, this sense is soon entirely lost in conditions of the nasal canals which interfere with its respiratory function.

The difference we have noted in the anatomical construction of this portion of the upper air tract — the nasal canals — is naturally resultant in different pathological effects in the different races as regards the particular portions of the respiratory tract most frequently becoming the seat of disease processes under the influence of atmospheric irritation. Less protection is afforded the lung structures of the negro race on account of the anatomical structure of his nasal canals, since less opposition to the irritating factors of the atmosphere is presented, by reason of the more patent and more direct course which the inspired air encounters. That the lung structure of this race in the United States suffers from the irritation caused by degenerating atmospheric conditions seems to the writer to be evinced by data of the Tenth Report of Vital Statistics of the United States, compiled by Dr. John S. Billings.

Among many other facts of great significance in this compilation we are shown that the number of deaths per 1,000 from consumption — the disease *most* dependent, perhaps, upon irritating qualities of the atmosphere — is not only greater among the colored portion of our population, but it is in direct proportion

[1] American Journal of the Medical Sciences, 1883.

[2] "Darwinism," p. 460. Macmillan.

greater the more severe the rigors of climate encountered in the respective *areas of territory* from which statistical returns are cited. Thus in the Gulf coast region the proportion of deaths from consumption per one thousand deaths is about equal among the whites and blacks; but in the Middle Atlantic coast region the difference of numbers shown is a very distinct one.

In five specified areas of territory the exact proportion is as follows:—

The Number of Deaths from Consumption in 1,000 *Deaths from all Causes.*

	Whites.	Colored.
Middle Atlantic Coast Region	140.9	175.1
South Atlantic Coast Region	88 0	105.5
Gulf Coast Region	115.8	120.6
The Interior Plateau	138.4	126.7
The Ohio River Belt	150.7	238 1

Thus, while in the first case there is a difference of 34.2, in the third — the Gulf coast region — there is only a difference of a little less than 5; while in the fifth case a difference of 87.4 in the number of deaths per 1,000 from consumption exists.

We have, therefore, it seems to the writer, sufficient grounds upon which to advance the theory that the more patent condition of the nasal canals in the colored race is largely responsible for the more frequent occurrence in this race of lung disorders, as compared with the white races, in the United States.

Diseased conditions of the nasal canals in the dark race resulting in stenosis are especially rare; while, as every physician engaged in the clinical study of these disorders will testify, a condition of stenosis is one of the most common, and among the first, symptoms of disease involving this portion of the air tract in individuals of European descent.

It is unnecessary to say that the inference must not be drawn that a condition of stenosis is a safeguard against lung disorders. Any condition of the nasal passages which results in or necessitates *mouth-breathing* directly favors diseases of the lungs.

When a condition of the nasal passages exists prohibiting the free passage of air through them, the professional services of a physician or surgeon should be sought to remedy this defect. And since, as has been said, the nasal passages should be considered an integral part of the respiratory tract, the remedy should constitute not merely the rendering of this organ patent, but should also aim to restore it to a condition in which it may regain the ability of performing its normal functions of moistening, of warming, and of purifying, by freeing from irritating factors, the inspired air.

It is impossible to state how far the remedial effects of selection or evolution are modifying the peculiarities of anatomical structure of the nasal passages of the black race in the United States.

That these peculiarities become less prominent along with other racial peculiarities of the descendants of the negro race is, however, very evident to the accurate observer. To the untrained eye, the external characteristics of this organ are undergoing modification, and to clinical observers a like change is noted in the internal structure; but just how far this may be due to the admixture of white blood, and how far to selective and developmental modification, is beyond the power of the writer to estimate.

Professor W. S. Bayley of Colby University, Waterville, Me., has collected into a volume, with a separate title-page and index, notes on mineralogy which have appeared during 1892 in the *American Naturalist*. Professor Bayley is the editor of the Department of Mineralogy and Petrography of the *Naturalist*, and these notes summarize the papers that have been published during the past year. The volume will prove useful to those who wish to be posted on the literature of these two branches of science.

THE EFFECT ON THE COLLEGE CURRICULUM OF THE INTRODUCTION OF THE NATURAL SCIENCES.[1]

BY W. L. POTEAT, WAKE FOREST COLLEGE, N.C.

The natural sciences are at last firmly lodged in the college curriculum. They are a recent importation. Their exact position and relations are scarcely yet settled, and one may easily fall into the mistake, on the one hand, of unwarranted precision in setting forth their present status, and, on the other, of overconfidence in predicting their ultimate influence upon the culture of our higher institutions of learning. Our observation, however, has probably extended over a period sufficiently long to yield some reliable results, which at this stage of it may well be brought together.

I. What were the circumstances under which the sciences gained a place in our educational machinery?

The college curriculum in its present form is the result of a gradual growth from very ancient and rude beginnings. As in a living organism, the successive modifications of the bulk and complexity of its structure have been closely dependent upon its environment. It responds with great sensitiveness to changes in the world about it. Hence it comes to pass that the apparatus and methods of culture of one period and race differ more or less widely from those of all other periods and races. The history of this development is inextricably intertwined with the progress of external events. We must look, therefore, without, if we would find the explanation of the last great modification of the means of education.

Of course, science in some form and to some extent had a place in education long before the period which I now have in mind. On the other hand, in some quarters it may be said to be still fighting for recognition even at the present moment. Moreover, periods glide insensibly into succeeding periods. There are no sharp lines in nature. For that reason there can be none in history. And yet, in order to avoid confusion and irksome modifications of every statement, I must be allowed to draw a somewhat arbitrary line and consciously to foreshorten the stages of a continuous advance.

For reasons which seem to me sufficient, I draw the line at 1859, the date of the publication of the "Origin of Species," and characterize the 35 years following as the period of science in education. It will, perhaps be agreed that no book in the domain of science. not even excepting the work of Bacon or Newton, has produced an influence so far-reaching and so profound. This date I fix upon the more willingly, inasmuch as it marks the new birth of the science of biology, which has affected all departments of human thought more deeply and permanently than all the other sciences. And it I have chiefly in mind on the present occasion.

The characteristic feature of the intellectual life of the period since the publication of the "Origin of Species" is the ferment precipitated by its doctrine. And the education of the period, in its spontaneous adjustment to external conditions, wears the same unsettled complexion, with science for its dominant tone. The middle decades of this century are unrivalled in all the thrilling history of the development of natural knowledge. The "Report on the Progress of Science" during the twenty years next following the Revolution of 1789 and read before the Emperor Napoleon in 1808, while it records some great names, contains nothing to match the record of the forties and fifties. And the next thirty years carried the wave of discovery and generalization but little higher. But about 1840 the spirit of scientific inquiry grew more intense, laid under contribution a larger number of rarely equipped minds, and pressed forward to attack the problems of the physical universe with a degree of vigor, boldness, and consecration which could not fail of brilliant achievements. Since that epoch the application of machinery to industrial production and to locomotion and intercommunication has revolutionized our common lives and given us new standards of comfort and activity. This revolution in the external aspects of modern civilization, it must be observed, "has been preceded, accompanied,

[1] Abstract of a paper read before the North Carolina College Association at Raleigh, Feb. 25, 1893.

and in a great measure caused by a less obvious but no less marvellous increase of natural knowledge, in consequence of the application of the scientific method to the investigation of the phenomena of the material world." The three great achievements which give our period its unique position in the annals of science are, the doctrine of the molecular constitution of matter, the doctrine of the conservation of energy, and the doctrine of evolution. They relate and unify an otherwise bewildering chaos of observation and experimentation. They have not, as Professor Huxley has said, fulfilled Bacon's conception of the aim of science and superinduced new forms upon matter, but they have in a sense created nature anew. They have given it a new voice. They have invested it with a new dignity and fascination.

Now, the subjects of study, under the stimulating influence of these great generalizations had, near the beginning of our period of science education, multiplied with amazing rapidity. And each new comer at once upon arrival challenged the pre-emptive right of its predecessors to the whole territory of education. Moreover, it was at once apparent that many of the new subjects yielded themselves with great hopefulness to the function of mental culture and had, besides, an important bearing on the practical conduct of life. Should the new knowledge, which in a thousand quiet ways was spreading into the thought of the times and recasting it, be kept dark to the minds of the young? Should they be left to the sudden and possibly disastrous shock of it when they should emerge from their cloistered life in college and find it all abroad and confronting them in every path?

It *was* resisted at the threshold. Nor should we be surprised. Conservatism is not passivity, mere resistance. It is rather an active force. It is not rest, but momentum. Whatever interposes itself to modify or deflect this current must be prepared for a collision. Illustrations abound throughout the history of education. Cato the Censor opposed strenuously the introduction of Greek into the Roman education. "Believe me," he wrote to his son, "the Greeks are a good-for-nothing and unimprovable race. If they disseminate their literature among us it will destroy everything." Again, we find that in the sixteenth century Latin and Greek, which in the nineteenth have held the ground against science, had themselves to win their way into the schools against "the 'Parva Logicalia' of Alexander, antiquated exercises from Aristotle, and the 'Questiones' of Scotus." Thomas More wrote to the dean of a school in London in which the new learning was recognized, "No wonder your school raises a storm, for it is like the wooden horse in which armed Greeks were hidden for the ruin of barbarous Troy."

But there are two features of the resistance to science in the curriculum, which, so far as I know, are peculiar to this last growth-pain of the educational ideal. The first springs out of the fear that what may be called the poetry of life will be rudely dealt with by the scientist, who comes upon the stage with the clatter of retorts and instruments, with a pigeon-hole for every sentiment and a physical test for every phenomenon of the soul. The inimitable Charles Lamb, on the side of prose, supplies an illustration of this feeling in the essay on "The Old and the New Schoolmaster," wherein he confesses his sins against science, saying, "I am a whole encyclopædia behind the rest of the world," while he but poorly conceals his disgust at the pretensions of the modern successors of "those fine old pedagogues who believed that all learning was contained in the languages which they taught." Representing the poets, John Keats, in "Lamia," exclaims sadly: —

"Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in heaven:
We know her woof, her texture; she is given
In the dull catalogue of common things."

In Poe's "Sonnet to Science" we meet the same regretful aversion. A still more recent voice is raised in the prose and poetry alike of the late Mr. Matthew Arnold.

I own that I share in some measure this repugnance to bare, unrelated facts and the spirit of irreverence. But it is coming to be generally recognized that science does not rest in analysis, which is but its method to reach a higher synthesis. A catalogue of isolated facts, accumulated it may be with the infinite pains of an army of workers in field and laboratory, is of small value or significance except as it may contribute to the establishment of some great generalization or unifying conception. And, further, I doubt that the wholesome sense of mystery is dissipated by the progress of science. Her torch grows brighter with each passing year and shoots its rays farther into the surrounding darkness, but mystery walks ever at her side. She springs more questions than she solves. And so an increasing reverence is not only consistent with a widening intelligence, but in its higher and richer phases is dependent upon it. I believe, with the weighty testimony of George Eliot and Herbert Spencer and the practical illustration of the late Poet Laureate, that the knowledge of processes and causes, so far from clipping the wings of the imagination, in reality enlarges the sphere of its flight.

The second peculiar feature of the opposition to science in the curriculum alluded to above is the fear of its effect upon religious beliefs in the minds of the young. It would be easy to multiply illustrations of the supposed antagonism between religion and science, for it has had an unbroken succession from the trial of Socrates to the trial of Briggs; but I forbear. Here, again, the opposition is melting away as the limitations and real bearing of scientific inquiry are perceived.

So, then, we may repeat what was said in the beginning. The battle of the natural sciences for recognition in the schools is won. Universally won in theory, but the actual occupation of all the conquered territory is yet to be effected. As a rule, the entrance has been made in the higher institutions first. In England, the study of the earth and its productions is still but scantily represented in the instruction afforded by its great fitting schools. The case is much the same in our own country. Even where the sciences are taught in the primary and high schools it is too often book science, which is usually better not taught at all.

In North Carolina we may not say that so much as a beginning has been made in science teaching in our public schools and academies. I would respectfully submit it to the wisdom of this Association whether it should not take it upon itself to promote in some practical way the introduction of the natural sciences into these schools. Might not the colleges and State University help forward this reformation by publishing certain elementary courses in science as required for entrance? So far as I have been able to ascertain, Trinity, Wake Forest, and Guilford are the only institutions in the State that make such requirements.

In order to learn the position of the natural sciences in the higher education in North Carolina, I have made a canvass of the leading colleges, with the following tabulated result, which takes no note of elective classes, but only of prescribed:

Prescribed Recitations per week for four years for Bachelor of Arts:

	Total.	Nat. Sci.	Biology.	Percentage in Nat. Sci.	Percentage in Biology.
Davidson	65	4	0	6.1	0
Elon	69	10	.5	14.4	.7
Guilford	72	10	0	13.8	0
Trinity	67	4	0	5.9	0
University	61.5	6.5	0	10.5	0
Wake Forest	64	10	2	15.6	3.1

II. We may now consider specifically the effects which the natural sciences have produced upon the college curriculum.

1. The first which I shall mention recalls the physicist's doctrine of impenetrability. When science entered, room had to be made for it. That necessitated a movement of the constituent molecules of the curriculum upon one another, with the result of relaxing its rigidity. From the solid it passed to the semi-fluid state.

In America three expedients have been employed in the accomodation of the new subjects in the four years' college course. At first they were treated as "extras." Later they were admitted on terms of equality with the languages and mathematics, and all suffered some abatement in extent and thoroughness, it being held that elementary knowledge of all was more valuable for the purposes of a liberal education than extended knowledge of the remainder in case of the omission of science. The third expedient is as yet new, but has more than approved itself as the only one that can meet the conditions. I refer, of course, to the elective system. It is liable to abuse, perhaps it has been abused; but, under carefully weighed restrictions, it adds greatly to the culture-power of any curriculum. The disadvantages of the rigid curriculum are too apparent for statement. How many men have not achieved distinction in spite of the inflexible grind of the old college mill. On the other hand, how many single-gifted men have not been headed off and imprisoned in the unvarying meshes of collegiate requirements. Emerson speaks somewhere of "those classes whose minds have not been subdued by school education."

2. Closely associated with the relaxation of the rigidity of the form of education is the new conception of educational values that has resulted from the introduction of science instruction. The study of antiquity has lost somewhat of its prestige as a preparation for the life of to-day. But if the Greek and Roman life and literatures have lost their supremacy in general, they have not lost their disciplinary and quickening power for a certain order of minds. And to erect a scientific curriculum which should rigidly exclude these, as I believe Mr. Spencer proposed, would be a blunder only less disastrous than the reorganization of their old monopoly which was disintegrated by science.

3. I now mention last the catalytic force of science in the curriculum. Its presence has wrought the rejuvenation of the older subjects by supplying the illustration of a new and contagious method. They have acquired a new point of view, and in their treatment the emphasis is not now where it once was. They are immensely the gainers in educational value and in vitality. The ease and promptness with which they have responded to this scientific influence is the best guarantee of their permanence in the scheme of culture. The "new psychology," the "new political economy," and the "new history" may be mentioned as illustrations of this transformation. The Latin and Greek languages are no longer an end in themselves, but merely a means to the reproduction of the wonderful thought and life of the Latin and Greek peoples. Even theology, which, according to Macaulay, is the most rigid and unprogressive of all the systems of human thought, is showing signs of movement in response to the influence of the natural sciences — in particular, of biology.

THE MARINE BIOLOGICAL LABORATORY.—SIXTH SEASON, 1893.

IN addition to the regular courses of instruction in zoölogy, botany, embryology, physiology, and microscopical technique, consisting of lectures and laboratory work under the constant supervision of the instructors, there will be a number of lectures on special subjects, by members of the staff. A course of lectures in Embryology will be given by Professor Whitman; on the Morphology of the Vertebrate Head, by Dr. Ayers; and two or more courses in Invertebrate Zoölogy, by Drs. Bumpus, McMurrich, Rankin, and Morgan. There will also be ten or more evening lectures on biological subjects of general interest. Among those who may contribute these lectures may be mentioned, in addition to the instructors above named, the following: Drs. E. A. Andrews, Johns Hopkins University; Howard Ayers of the Allis Lake Laboratory; Professors W. G. Farlow, Harvard University; William Libby, Jr., Princeton College; J. M. MacFarlane, University of Pennsylvania; C. S. Minot, Harvard Medical School; E. S. Morse, Salem; H. F. Osborn, Columbia College; John A. Ryder, University of Pennsylvania; W. T. Sedgwick, Massachusetts Institute of Technology; E. B. Wilson, Columbia College.

The Laboratory is located on the coast at Wood's Holl, Mass., near the laboratories of the United States Fish Commission. The building consists of two stories, and has 33 private laboratories for investigators and 5 general laboratories — two for beginners in investigation in zoölogy, one for teachers and students receiving instruction in zoölogy, one for botany, and one for physiology. The Laboratory has aquaria supplied with running sea-water, boats, a steam launch, collecting apparatus, and dredges; it is also supplied with reagents, glassware, and a limited number of microtomes and microscopes. *No alcohol can be supplied beyond what is required for work in the laboratory.*

By the munificence of friends the library will be provided not only with the ordinary text books and works of reference, but also with the more important journals of zoölogy and botany, some of them in complete series.

The Laboratories for Investigators will be open from June 1 to Aug. 30. They will be equipped with aquaria, glassware, reagents, etc., *but microscopes will not be provided.* In this department there are 33 private laboratories for the exclusive use of investigators.

Those who are prepared to begin original work under the guidance of instructors will occupy tables in the general laboratories for investigators, paying for the privilege a fee of fifty dollars. The number of such tables is limited to 20.

An elementary course in vertebrate embryology will be introduced this season, designed to meet the needs of those who have completed the general courses in the Students' Laboratory. The study will be confined mainly to the fish egg as the best type for elucidating vertebrate development. Each member of the class will be supplied with material and be expected to work out each step in the development from the moment of fecundation. The aim will be not only to master the details of development but also to acquire a thorough knowledge of the methods of work. Methods of preparing surface views, imbedding in paraffin and celloidin, various methods of staining and mounting, drawing, reconstruction, modelling, etc. The course will thus combine just what is needed as a preparation for investigation.

This course will open Wednesday, July 5, and continue six weeks, and it will be conducted by Mr. Lillie and Professor Whitman. The fee for this course will be fifty dollars, and the class be limited to ten.

Applicants should state what they have done in preparation for such a course, and whether they can bring a complete outfit, viz., a compound microscope, a dissecting microscope (the Paul Mayer pattern made by Zeiss is the best), camera-lucida, microtome, etc. In case these instruments are furnished by the Laboratory, an additional fee of ten dollars will be charged therefor. No applications for less than the whole course will be granted.

The Zoölogical Laboratory for teachers and students will be opened on Wednesday, July 5, for regular courses of six weeks in zoölogy and microscopical technique. The number admitted to this department will be limited to fifty, and preference will be given to teachers and others already qualified. By permission of the director and by the payment of additional fees, students may begin their individual work as early as June 15, but the regular instruction will not begin before July 5.

Though more advanced students who may wish to limit their work to special groups will have an opportunity to do so, the regular course in zoölogy, in charge of Professor Bumpus, will embrace a study of the more typical marine forms and elementary methods of microscopical technique. The laboratory work, outlined below, will be accompanied by lectures.

July 5–8. Study of the Lobster. (General anatomy — methods of injecting — preparation of histological material.) July 11–15. Cœlenterates (*Campanularia, Tubularia, Metridium, Mnemeopsis*). July 17–22. Vermes (*Nereis, Balanoglossus,* and *Phascolosoma, Polyzoa, Bdelloura*). July 24–29. Echinoderms (*Asterias, Arbacia, Echinarachnius, Thyone*); Mollusks (*Venus, Sycotypus, Loligo*). July 31–Aug. 5. Crustaceans (*Branchipus, Pandarus, Lepas, Idotea, Talorchestia, Cancer, Limulus*). Aug. 7–15. Vertebrates (*Amphioxus, Raja, Teleost*).

The tuition fee is thirty-five dollars, payable in advance. Ap-

plicants should state whether they can supply themselves with simple and compound microscopes, or whether they wish to hire. Microscope slides, dissecting and drawing implements, bottles, and other supplies, to be finally taken away, are on sale at the Laboratory. Further information in regard to this department may be had by addressing Professor Hermon C. Bumpus, Wood's Holl, Mass., to whom applications for admission should also be made.

The Botanical Laboratory for Teachers and Students will be opened on Wednesday, July 5. The laboratory work in botany will be restricted to the study of the structure and development of types of the various orders of the Cryptogamous plants. Especial attention will be given to the study of the various species of marine Algæ which occur so abundantly in the waters about Wood's Holl, and students desiring to give their entire attention to these plants will be encouraged to do so. The fungi and higher Cryptogams will receive less attention than the Algæ, but will be studied in fewer types. Lectures will accompany the laboratory work. The course may be outlined somewhat as follows:—

First week. *Cyanophyceæ:* Lyngbya, Calothrix, Rivularia, Stigonema, Tolypothrix, Anabæna. Second week. *Chlorophyceæ:* Spirogyra, Ulva, Enteromorpha, Chætomorpha, Bryopsis, Vaucheria, Oedogonium; *Phæophyceæ:* Ectocarpus, Mesogloia, Leathesia, Laminaria, Fucus, Sargassum. Third week. *Rhodophyceæ:* Batrachospermum, Nemalion, Callithamnion, Chondriopsis, Rhabdonia. Fourth week. *Phycomycetes:* Mucoe, Sporodinia, Peronospora, Cystopus, Achlya; *Uredinei:* Aecidium, Uredo, Puccinia, Uromyces. Fifth week. *Basidiomycetes:* Agaricus, Lycoperdon; *Ascomycetes:* Microsphæra, Sordaria, Peziza, Physcia. Sixth week. *Muscineæ:* Riccia, Madotheca, Marchantia, Mnium, Tetraphis, Hypnum; *Filicineæ:* Dicksonia, Adiantum, Equisetum, Lycopodium, Marsilia, Selaginella.

The tuition for students in the regular course of laboratory work and lectures is thirty-five dollars, payable in advance; for students engaged in investigation the tuition is fifty dollars.

Students are expected to supply their own instruments, or to pay an extra fee for those borrowed from the Laboratory. Applications should be addressed to William A. Setchell, 2 Hillhouse Avenue, New Haven Conn.

The Physiological Laboratory will be open from June 1 to September for investigators.

Rooms, accommodating two persons, may be obtained near the Laboratory, at prices varying from $2 to $4 a week, and board from $4.50 to $6. By special arrangement, board will be supplied to members at The Homestead at $5 a week.

A Department of Laboratory Supply has been established in order to facilitate the work of teachers and others at a distance who desire to obtain materials for study or for class instruction. Certain sponges, hydroids, starfishes, sea urchins, marine worms, crustaceans, mollusks, and vertebrates are generally kept in stock, though larger orders should be filed sometime before the material is needed. Circulars giving information, prices, etc., may be obtained by addressing the collector, F. W. Walmsley, Wood's Holl, Mass.

Wood's Holl, owing to the richness of the marine life in the neighboring waters, offers exceptional advantages. It is situated on the north shore of Vineyard Sound, at the entrance to Buzzard's Bay, and may be reached by the Old Colony Railroad (2¼ hours from Boston), or by rail and boat from Providence, Fall River, or New Bedford. Persons going from Boston should buy round-trip tickets ($2.85).

The Annual Report of the Trustees, containing an account of the organization and work of the Laboratory, may be obtained from the secretary, Anna Phillips Williams, 23 Marlborough St., Boston.

The officers of instruction are: C. O. Whitman, director, head professor of zoölogy, University of Chicago, editor of the *Journal of Morphology*. Zoölogy — A. Investigation, Howard Ayers, director of the Allis Lake Laboratory; J. Playfair McMurrich, professor of biology, University of Cincinnati; E. G. Conklin, professor of biology, Ohio Wesleyan University; F. R. Lillie, fellow in zoölogy, Chicago University. B. Instruction, H. C Bumpus, professor of comparative anatomy, Brown University; W. M. Rankin, instructor in zoölogy, Princeton College; Pierre A. Fish, instructor in physiology and anatomy, Cornell University; A. D. Mead, fellow in zoölogy, University of Chicago. Botany — W. A. Setchell, instructor in botany, Yale University; W. J. V. Osterhout, Brown University. Physiology — Jacques Loeb, assistant professor of physiology, University of Chicago. Ryoiche Takano, artist; F. W. Walmsley, collector; and G. M. Gray, laboratory assistant.

ELECTRICAL NOTES.

THE paper by Dr. Sumpner on "The Diffusion of Light" is one of the most important pieces of work which has recently been published, especially from the practical side. It shows us at once how to calculate the amount of light necessary to illuminate a room of any shape or size, provided only that we know the material used for decorating it. Hitherto this has been done on the happy-go-lucky plan, for, although a rule has been laid down by Mr. Preece to the effect that one candle-power should be used for every square foot of floor space, the well-known antipathy which mathematics bears to Mr. Preece has caused this formula to be looked upon with suspicion; and in this case with reason. The work of Dr. Sumpner is, however, of an entirely different class, and his results may be depended upon for making practical calculations. The principal result of his work is a knowledge of the immense effect that the material covering the walls of a room has on the amount of light required to illuminate it to a given degree. We learn that the amount of light reflected from a newspaper or piece of foolscap is equal, within 10 per cent, to that reflected from a good glass mirror. The following figures may be of interest (deduced from his results):—

I.	II.
Black cloth,	100
Dark-brown paper,	87
Blue paper,	73
Yellow paint (clean),	60
Wood (clean)	50
Wood (dirty),	80
Cartridge paper,	20
Whitewash,	15

Column I. gives the material covering the walls of the room of a given size, and column II. the proportionate number of candles necessary to light it. It will be seen that it takes nearly six times as much candle-power to illuminate a room papered with dark-brown paper as it does to illuminate to an equal degree a whitewashed room. While, of course, we cannot sacrifice æsthetics to economy, it is evident that by suitably choosing the paper of a room, no inconsiderable saving in gas bills may be effected.

R. A. F.

NOTES AND NEWS.

A NEW society has been organized in Washington under the name of the "Geological Society of Washington." The officers are: President, C. D. Walcott; vice-presidents, S. F. Emmons and W. H. Holmes; secretaries, J. S. Diller and Whitman Cross; treasurer, Arnold Hague; council, G. F. Becker, G. H. Eldridge, G. K. Gilbert, G. P. Merrill, and T. M. Chatard. The members are classified as resident and corresponding, the dues of the former being $2 and of the latter $1 per annum. The meetings are held on the second Wednesday of each month from October to May, inclusive. The membership already numbers 106. The members need not be geologists themselves: to have an interest in the subject is sufficient to entitle one to the privileges of the society. Its object is the presentation of short notes on work in progress rather than the reading of elaborate papers. The first scientific meeting was held March 8, at which, after an introduction by Major J. W. Powell, Director of the Geological Survey, a paper was presented by Mr. H. W. Turner, on the Structure of the Gold Belt of the Sierra Nevada. Mr. S. F Emmons then read a paper on the Geological Distribution of Ore Deposits in the United States.

SCIENCE:

PUBLISHED BY N. D. C. HODGES, 874 BROADWAY, NEW YORK.

SUBSCRIPTIONS TO ANY PART OF THE WORLD, $3.50 A YEAR.

To any contributor, on request in advance, one hundred copies of the issue containing his article will be sent without charge. More copies will be supplied at about cost, also if ordered in advance. Reprints are not supplied, as for obvious reasons we desire to circulate as many copies of *Science* as possible. Authors are, however, at perfect liberty to have their articles reprinted elsewhere. For illustrations, drawings in black and white suitable for photo-engraving should be supplied by the contributor. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

HYDROGRAPHIC AREA OF THE RIO WANQUE OR COCO IN NICARAGUA.

BY J. CRAWFORD, CAPE GRACIAS AL DIOS, NICARAGUA.

ABOUT four miles west from the town Ocotal, capital of the Department of Nueve Segovia, in Nicaragua, at about Long. 86° 40' west (from Greenwich) and Lat. 13° 30' north, the waters in the large creeks Somote-grande and Maculiso, unite and form the commencement of a river, known to all persons living on its banks, for fully three-fourths of its length, from its mouth up as Rio Wanque,[1] for the remaining fourth as Rio Coco or Rio Segovia.

The general course of this river, for the first ninety miles from its commencement down to the mouth of a confluent, the Rio Phantasma, is eastwardly and from thence to its disembogue into the Caribbean Sea at Cape Gracias a Dios, is about 22° east from north, but it is very sinuous, changing its course every three-fourths of a mile to every two miles of its length as it flows rapidly near to or along the southern side of "The mountain system of New Segovia."[2]

The important creeks and rivers are herein named in the order they enter the Wanque River, commencing at the most westerly.[3]

Rio Somote-grande, rising on the south side of Dullsupo Mountain ridge,[4] and flowing southeasterly to where it unites with the Rio Maculiso, and forms the Wanque River.

Rio Maculiso, draining the southern side of the mountain range, Ococan (to the N. E. of the Dullsupo Mountains), composed in part of the mountain ridges, Maculiso, Santa Maria, and Ococan (about Long. 86° 50' W., and Lat. 13° 20' N.) and flowing southeastwardly until uniting with the Rio Somote-grande, and forming the Segovia or Wanque River.

Rio Depilto, receiving its waters principally from the southerly sides of the mountain ridges Ococan, Depilto, and Jalapa, and flowing southwardly, between moraine ridges for a part of its route until confluent with the Segovia or Wanque on the southeast side of Ocotal.

[1] Rio "Coco," "Segovia," "Wanx," or "Wanque." Coco, abbreviated from Cookra, the name of the aborigines once living on its banks, has precedence because of antiquity. Segovia, the next oldest name, was given to it by the Spaniards, and it is now known as Rio Segovia by the Latin and North Americans and Europeans living near it and near its headwaters in the department of Nueve Segovia, and is the official name used by the Government of Nicaragua for that part of this river. At its mouth, however, it is officially referred to as Rio Coco or Wanx. Wanque is the name invariably used by the Sambos (a mixed semi-civilized people) living along two-thirds of its length from Cape Gracias up the river. Also, the Sumo Indians, living along one of its largest tributaries, the Rio Bokay, always name it Rio Wanque.

[2] So named by Élie de Beaumont. For its direction, locality, etc., see Professor Joseph Prestwich's Geology, London, 1886.

[3] Recorded in this paper because convenient, at present, for reference to locate lodes and deposits of valuable minerals and metals, and groves of valuable trees discovered near to these rivers and creeks.

[4] The locality is known as "rin on del burro" (i.e., resembling dimly a mule) and is a landmark guide in that part of Nicaragua, where no roads have been made and the paths are often dim.

Rio Palacaquina, percolating from old volcanic ridges on the southwest, it flows northeastwardly until its waters enter the Wanque or Segovia at the Indian village of Telpanaca.

Rio Jicore has as its principal hydrographic area the southern sides of the mountain ridges of Jalapa, Jicore, Encino, and Murar, in the Encino Range of mountains, and also the Quilali and San Juan del Panaca Mountains in the Quilali Range, and flows southeastwardly until entering the Wanque River at Pueblo Quilali.

Rio Phantasma flows from the south, draining ridges that form the Phantasma Range in the mountain system of Matagalpa.[5]

Rio Quä from the southwest, rising in the Quä Range in the Matagalpa System of mountains[5]

Wa-wa-lee Creek, from the northeast; it drains a part of the short ridge Ventura, in the mountain system of Nueve Segovia.

Kilambe Creek, from the south, rising from a long mountain ridge of that name.

Rio Opoteka enters the Wanque River from the northward and drains the southern side of the Opoteka Range in the mountain system of Nueve Segovia.

Rio Wanblau, from the southeast, joins the Wanque River near the head of the long series of cascades in the Wanque known as Ke-y-on; it drains the northeastern termination of the ridges Wan-blau, Keyon, and Pene Blanca (about 7,000 feet altitude above the Caribbean Sea, the highest mountain in Nicaragua) in the mountain system of Matagalpa.

Ya-male Creek flows from the west into the Wanque near the foot of the cascades Keyon.

Peas Creek, from the southeast, gathers its waters from a low ridge that is within four leagues of the Rio Bokay, to the south.

Bolemaca Creek, flowing from cerros of that name (that are composed of cryptocrystaline limestone intersected by numerous interusculating veins now filled with crystallized calcite), eastwardly into the Wanque River; the mountain Bolemaca is in the system of Matagalpa.

Oulawas Creek, flowing from the east from a cerro named Kay-än that is composed of marble and compact limestones.

Rio Bokay, from the southeast and east, about one-half of the size of the Wanque River, drains the hydrographic area on the east side of the mountain ridges Pene Blanca and Barbar, and the north side of the Wanblau Mountains; its general course is northeastwardly, near to and parallel with the Wanque River in that part of the country.

Wylawas, Attawas, and Saccos Creeks come from the eastward, draining, through placer gold mines at their heads, a part of the western side of a long lateral moraine of glacial epoch, unstratified deposits of clays, gravels, boulders, and sands.

Six creeks, flowing eastwardly from the mountain system of Nueve Segovia, examined and names not recorded, but reported by the Sambos to have along near their banks numerous groves of large-sized mahogany, cedar, walnut, and rosewood trees.

Naga-was Creek, from the northwestern end of the long lateral moraine above mentioned, flowing northwardly through placer gold mines to the Wanque River.

Rio Wash-pook, draining the northeastern end of the lateral moraine above mentioned, and entering the Wanque from the southeast; several of its tributaries drain placer gold mines, also lodes containing gold.

From the mouth of the Rio Wash-pook, east of north and north to the Caribbean Sea, is the delta of the Wanque River, embracing several lagoons and lakes and intersected by several inter-connecting natural canals. There are three long series of cascades and low falls in the Wanque River. The most westwardly commences a few miles below (N. E. of) the mouth of the Rio Opoteka, at the locality named Ke-y-on, where the river has eroded about 3,000 feet in depth from the present altitude at the south end of the mountain ridge Opoteka, and about 2,700 feet depth from the altitude at the northern terminatoin of the Keyän Mountains. The other two long series of cascades are below the

[5] This mountain system was so named in 1889 by the author of this paper and examined by him on its southern ridges up to the water-dividing ridge in 1890.

mouth of the Saccos Creek and continue with short intervals between the two series, for about 75 miles. These series of cascades, the Ke-y-on, Saccos, and Naga-was, impede the navigation of the Wanque River; passing up or down over them being quite dangerous even on rafts or in the light oval-bottom canoes, the only kind of transportation at present on this river; consequently the area drained by about 250 miles of this Wanque River (including, also, the hydrographic area of the Rio Bokay, from the mouth of Rio Qua to the mouth of Rio Wash-pook) is a "terra-incognito," about which neither the citizens nor the Government of Nicaragua have any reliable information; however, rafts of logs of cedar, mahogany, walnut, nispero etc., can be safely floated over the cascades and down the Wanque River to Cape Gracias a Dios.

The soils in the area drained by the Wanque River and its tributaries, extending about one hundred miles from the Caribbean Sea coast are fertile, alluvial, delta lands, suitable for the production of plantains, bananas, bread-fruit, rice, ginger, sugar-cane, grasses (Teocinte, Guinea, and Para are indigenous), and along the sandy rim of the sea-coast cocoanuts grow to large size and are numerous on each tree. From thence up the hydrographic area of the river the lands are composed, usually, of a deep and fertile soil constituted generally of a large percentum of partly decomposed organic matter, mixed or inter-laminated, to depths of five to fifty feet, with deposits, in situ, of disintegrated and partly decomposed lime — alkali — or ferriferous rocks. These lands support dense forests of trees and jungles of vines and plants of semi-tropical and warm-temperate vegetation, and are suitable for the annual or semi-annual yield of full crops of rice, corn, ginger, bananas, plantains, also annual yield of cācā, mangoes, coffee (the Liberian species), vegetables, bread-fruit, oranges, lemons, limes, etc., and lands on the sides of mountains and their elevated planes, above 1,500 feet altitude above the Caribbean Sea or Gulf of Mexico, are suitable for tobacco, almonds, grapes, coffee (the Arabic species), corn, oranges, lemons, limes, vegetables, etc. (All the lands in Nicaragua are below the frost-line.) From the Rio Jicore, up westwardly on the area drained by the Segovia or Wanque River and its tributaries, the lands are generally sand, gravel, and clay; in this region the rocks have not disintegrated so rapidly nor to such depths by meteorological influences as they have down the Wanque River below the Rio Jicore, or the vegetable matter, alkalies, and alkaline earths have been removed by rain water. In some parts of the western headwater localities, especially just northeast of the town Ocotal, the surface lands are largely drift from moraines, and not desirable for agricultural purposes.

The climate has a wet and a dry season each year; the former continuing over the area from the sea-coast up the Wanque, to about the mouth of the Opoteka, for fully seven months. However, in a part of that time, the rain showers, although two or more times a day, are only of a few minutes' duration; for about five months in each year there are no, or but a few, showers of rain; enough, however, to counteract in part the effects of rapid evaporation.

The temperature is semi-tropical from Cape Gracias up the Wanque River to the mouth of Rio Opoteka, especially in the lower valley lands, but cooler on the mountains' sides and on the elevated planes, where the temperature varies in the year from 22° C. to 32° C. From Opoteka up to the western sources of the Wanque River, the temperature is — between low land and mountain planes — from 12° C. (sometimes) at night to 30° C. at noon, the average daily temperature being about 27° C.[1]

Several large mineral springs are found at the heads of the western tributaries to this river, some of them containing salts of the alkalies or alkaline earths, others salts of iron. No sulphur springs were discovered. Some of these are cool water, others tepid, others boiling waters. The principal localities observed, where springs of mineral waters were found, are:—

A large spring of tepid water containing sulphate of magnesia as its principal salt (and other sulphates) located one league west from the town of Ocotal, near to the margin of the Segovia or Wanque River. Several large springs of boiling water were found near the foot of an arenaceous limestone ridge, about four leagues northwest from Ocotal (rose quartz is found in the creek of hot waters, in pieces of various size, some containing a cubic foot). This creek has a temperature of about 50° C., two miles distant from the springs, where it enters Rio Maculiso.

Several large springs of boiling waters are found near the Pueblo Jalapa (on Jalapa Creek, a confluent to Rio Jicore) one of them containing lithia salts in quantities to be easily recognized.[2]

Among the most valuable and useful in the industrial arts, medicines, etc., of the flora observed in the area drained by this river and its tributaries, the principal ones, found in such large numbers and in such large size that the collecting and exporting of them could be made a profitable industry, were noted more particularly at the following named localities; these areas, however, represent only a few of the many similar groves and forests that were not entered and examined.

From the western sources of the Wanque or Segovia River, down its area to the Rio Phantasma are, in order as observed from the west, oak (quercus), pine (pinus silvestrus), sarsaparilla, ipecacuana, liquid amber, balsam (Peru and Copaiva), nispero, tamarind, mora, walnut (a variety of Ingulaus catharticа), copal-chi, and other species of cinchona, ironwood, ebony, mahogany, cedar (a variety of junipuris), guana (a cellular, endogenous tree of specific gravity near cork and compressible like cork), ginger, fibrous plants (in great variety and luxuriance), cā-cā (Theobroma, indigenous), grasses, bananas, plantains, oranges, lemons, also a great variety of beautiful orchids and flowering plants.

From the Rio Phantasma to Laccos Creek, including the area drained by the Rio Bokay and its tributaries are mahogany, cedar, walnut, ironwood, ebony, nispero, mora, guana caste, guana, cinchonas, rosewood, guttapercha, tamarind, also numerous large groves of India rubber trees (usually Syphonias) of small size (the larger ones having been felled by collectors of India rubber), grasses (Teocinte, Para, and Guinea are indigenous), cā-cā (Theobroma), bamboo (attaining fourteen inches in diameter), ginger, bananas, plantains, etc.

From Laccos Creek to the Caribbean Sea are principally tamarinds, palms ("pebepias"), bread-fruits, and cocoanuts.

The types of man living or existing in the hydrographic area of the Wanque River of about 15,000 square miles are,—

From the western headwaters of the Wanque to Rio Phantasma, Latin-Americans and partly-civilized Indians, interspersed by a few Europeans and North Americans. (Negroes in one Pueblo, Cindad Viejo.) Their ancestors came in the 18th century from Belize or the island of Jamaica to fell cedar and mahogany trees for some company of Englishmen; the chief occupation of a majority of the people in that region being agriculture or mining on small scale and by primitive processes (i.e., sharpened sticks and machetes; no plows, no hoes).

This area embraces about 4,000 square miles and contains about 16,000 population.

From the Rio Phantasma along the banks of the Wanque River — east of north — to the Caribbean Sea are Sambos.[3] They live

[1] My reliable thermometers were broken early in each expedition to northeastern Nicaragua, i.e., in 1890, when exploring the mountain system of Matagalpa, and this year, 1892, when examining and exploring the hydrographic area of the Rio Wanque, Segovia, or Coco.

[2] Analyses of some of these springs are reported to have been made, but the name of the chemist is not given. The author of this paper has not yet had opportunity to analyze or have analyzed any of these waters.

[3] The Sambos are a mixture of Caribs, Negroes, and Europeans, the Negro predominating, although they have straight hair and nose, and exhibiting distinctly the rapid retrogressive influence towards Primates, caused by this mixture of the types above named; a small profile or sideview of the faces of a majority of this people would be mistaken easily at first glance for that of an anthropodia monkey. A part of this people, however—a mixture of Negro, Sumo, Indian, and European (usually Spanish) — are less rapid in their degenerating tendency. The Sambos have a language largely of modifications from the Sumo Indians, the English, and the Spanish. They claim allegiance to the King of the Moskoes (Mosquitoes) Indians, but have no laws, no government, no officials, no schools, no agriculture, no churches, no religious faith, no conception of a future existence after death on earth (although sometimes they bury food, clothing, and cooking utensils with their dead); without an idea of moral responsibility, they have become experts in deceptive practices; they are excellent canoe-men, navigating the river up and down through the cascades without injury to themselves or their canoes (made oval bottom in one piece from a cedar or mahogany log). They live on roots, fruits, fish, and wild animals (one variety of monkeys included). The women invariably do the greater part of the work, such as collecting wood, fruits, and roots, cooking, carrying water, etc., and "dress" in a short-sleeve jacket extending to their waists; then down to their ankles is covered by a wrapper of one piece of cloth tied by withes of bark or by pieces of vines around their waist. All are lazy, idle, and brutish.

in small communities and number about 2,000, also about forty Latin-Americans live on the banks of this part of the river and on the banks of the Rio Bokay.

On the Rio Bokay and its tributary, the Rio Amaca, there live about 300 Sumo Indians, descendants from the Cookras. Their houses are better constructed than those occupied by the Sambos; the houses of both Sumos and Sambos being only roofs of palm-leaves, tied onto upright posts of—generally—bamboo; no walls; only dirt floors.

The Sumos are a superior people — intellectually, physically, and morally — to the Sambos. They have a language modified from that of their progenitors, the Cookras (aborigines), and including some English words. They have numerals to twenty, but like the Sambos are very dull in numbers. They have no laws, no religious faith, no schools, no agriculture, no feast days. They bury cooking utensils, clothing, and food owned by their dead with the cadaver. They have small-area, community patches of bananas, which they never cultivate.

Nicaragua has no officials in the territory claimed by her from the mouth of the Rio Phantasma, northeastwardly, to near Cape Gracias a Dios. It is a lawless part of her territory.

The mountain system of Nueve Segovia, composed largely of Eozoic and early Palæozoic systems of rocks, is delineated at the earth's surface, on its northwestern side, by the Rios Patuca (emptying into the Gulf of Mexico) and Choluteca (flowing southwestwardly into the Gulf of Fonseca), from the Mesozoic, Kainozoic, and recent formations in Honduras, which have all been elevated into mountains whose meridional trend is at nearly right angles to the about 22° E. of N. and W. of S. alignment of the ranges in the mountain system of Nueve Segovia. On the south side of this Nueve Segovia system flows the Wanque River for about three-fourths of the entire length of the mountains, and at its southwesterly side is the Rio Negro (a confluent of the Choluteca, flowing around the western termination of the mountain system). It is, so far as known, a monogenetic system, and its anticlines expose Eozoic and Palæozoic formations in systems of sinuously outcropping rocks. The largest exposed areas of Eozoic and Palæozoic rocks are on the Ococan Range at the mountain ridges Maculiso, Santa Maria, and Ococan, and consist largely of granite, slates, gneiss, and extensive deposits of both iron ores (Titanite, Magnetite, and Hematite) and limestones, interstratified at two localities, and of graphite. The mountain ridges Dullsupo (southwestwardly from the Ococan Range) and of Depilto, Jalapa, Jicore, Quilali, Ventuo, and Opoteka (to the northeast from Ococan) have *cine del cerros* of Eozoic and early Palæozoic rocks, and exposed on their sides are upper Silurian, Devonian or carboniferous — including the Dios — system of rocks.

The mountain system of Matagalpa has the Wanque River at its northern, and the Matagalpa River at its southern surface boundary. Its present southwestern termination is about Long. 86° 45′ W. and Lat. 12° 36′ N. (a few leagues southwestardly from the Pueblo San Dionesia); to the southwest of this termination, on to the Gulf of Fonseca, the mountain ridges have been levelled to a low plane, on which are numerous subsequently elevated intumescent hills and knolls. In this plane the localities once occupied by the mountain ridges are now marked by the continuation,— southwestwardly,— from the present termination of the ridges to the Gulf of Fonseca, of lodes that in several places are rich in gold; and along near to the lodes are many small knolls or low ridges of pinkish and purplish colored argillaceous gangue of an aluminate of gold (containing $Au\ Al_2$) in a percentum that could be made profitable to miners. The present southeastern terminations (it has two) of this mountain system are: the most northerly, the low limestone ridge and hills terminating at the Rio Princapulka, a few miles west from the Pueblo Quequena (lower carboniferous limestone there), the other eastern termination is more southerly and is known as the Barbar Mountains, where it breaks off abruptly with jagged edges (not partly smoothed or slickened side surfaces as usual with faults). The general course of this mountain system is parallel with that of the Nueve Segovia system to the north; from its western termination, along three-fourths of its length, to the Wanblau Mountains; from thence to its eastern terminations the entire system of ranges and ridges have been bent into a crescent (the concavity facing northeastwardly), or this system of mountains deflects in a curve southeastwardly from the Wanblau Mountains and then northeastwardly to its present termination at the Barbar Mountains, excepting the limestone ridges on the north side of the system; these continue parallel with the Nueve Segovia system until they terminate near Quequena in lower carboniferous limestone.

This bend or deflection in the Matagalpa system of mountains forms the hydrographic area of the Rio Bokay, which has eroded a channel through the ridges of limestone. The central range, Pene Blanca, has an exposed longitudinal axis of Eozoic granites and gneiss, flanked usually by formations in the Palæozoic system of rocks, and those by Mesozoic or later deposits, limestones occupying a larger area in this than in the mountain system of Nueve Segovia. The Matagalpa system of mountains is probably polygenetic; the long, low, much-eroded ridges of limestone at the north side of the system were evidently elevated subsequent to the curving of the other ranges composing this system.

The minerals and metals in most common use and of the greatest value discovered in the hydrographic area of the Wanque River are, and their localities are as follows:—

In Dullsupo Mountains are lodes of ores of silver and copper.

In the Maculeso Mountains are lodes of ores of silver, tin, arsenic, antimony, also gold in the gangue in one lode examined, between two different geological formations, and it appears to be a very valuable gold-containing lode.

In the Santa Maria Ridges are lodes containing gold, and gold and ores of silver, also ores of silver and copper, and a deposit of galena and silver in a fissure 21 feet wide and traceable for more than three miles, also deposits of iron ores and limestones.

In the Ococan Mountains is a large deposit of lower Silurian or earlier iron ores (Hematite and Titanite) and limestone, the latter between two thick deposits of iron ores.

In the Depilto Mountains the lodes are rich in galena and silver, also lodes containing gold and ores of silver.

In the Leuje Hills (east about thirty miles from Dullsupo Mountains) are lodes and deposits rich in gold that is generally about 925 fine.

In the mountains of Pericon and San Juan del Panaca the lodes contain silver ores and gold, often in particles of size to be seen by the unaided eye; and further to the eastward, in the mountains (and creeks) Quilali (the Quilali is a tributary of the Rio Jicore) grains and small masses of platinum have been found associated with gold.

Crossing the Wanque River, about one mile west from the Rio Phantasma is a large strata of early Palæozoic, argillaceous slate in which are numerous veins, 1 Mm. to 2 Cm. wide, having a gangue of quartz and ores of silver, and also deposits of silver ores have been interlaminated with the slate.

From the mouth of the Rio Phantasma, northwardly to the mouth of the Rio Washpook, the difficulties and delays at present associated with the transportation of necessary instruments, provisions, etc., from place to place, are so great (even to a naturalist accustomed to excursions along and over mountains, and through forest jungle, and up and down through the cascades and "rapids" in rivers and creeks) that examinations of sufficient accuracy to record were made only at a comparatively few places, sufficient, however, to ascertain that the numerous lodes in this large area usually contain, as the principal metals, gold and ores of silver; also there are large deposits of marble and of cryptacrystaline limestone; also placer mines rich in gold have been discovered, especially in the area drained by the southern and eastern tributaries to the Rio Bokay and at the heads of Wylawas, Attawas, Laccos, and Nagawas Creeks and the southern and southeastern tributaries to the Rio Washpook.

The gold in these placer mines are in interlamina crevices in slate rocks and in superimposed stratified and partly stratified deposits of drift (sands, gravels, small boulders, and clays) that was eroded and transported by rain floods during the Champlain Epoch from terminal and lateral moraine deposits of the Glacial Epoch. The placer mines containing gold in the eastern

and northeastern part of the hydrographic area of the Rio Bokay, also the placer mines of gold along tributaries of the Wylawas, Attawas, Laccos, and Nagawas Creeks and the Rio Washpook have all been eroded and transported by currents of water from the lateral moraine (about 60 miles long and 800 to 1000 feet altitude above the level of the valleys) that extends northeastwardly from the Barbar Mountains (the easterly termination of the Matagalpa system of mountains) to the Rio Washpook; and on the southeastern side of this series of terminal and lateral moraines are the placer mines, also quite rich in gold, discovered in 1889 at Principulka.

P.S.—Since writing the above an opportunity occurred to pass through and hurriedly examine a part of "the placer" mines containing gold along one of the headwater confluents of Nagawas Creek (tributary to Rio Wanque) and they gave such results from panning as to indicate much gold in the deposits, although no satisfactory estimate of the quantity of gold in the cubic yard of the gold-containing gravels was made because the examination was hurriedly made and the "bed rock" on which the gravel deposits rested was either not reached or not examined at any place in that locality. These are drifts eroded and deposited by floods from the Glacial Epoch lateral and terminal moraines in that region.

NATURAL AND ARTIFICIAL CEMENTS IN CANADA.

BY H. PEARETH BRUMELL, GEOLOGICAL SURVEY DEPT., OTTAWA, CANADA.

IN the last report of the U. S. Geological Survey on the mineral resources of the United States, and under the heading of Cement, particular stress is laid upon the fact that there has recently been discovered in California an extensive deposit of natural cement rock, and the fact of its importance to the State is spoken of at length. The knowledge that a good, yet cheap, cement is of importance to any district has led the writer to prepare the following brief statement regarding cements in Canada.

We have in this country a practically illimitable store of materials applicable to the manufacture of natural and artificial hydraulic cements, of both of which we are now producing a considerable quantity, the production for 1891 being about 93,473 barrels of all kinds. Of this, however, the greater part was of natural cement, and the total production altogether that of the provinces of Ontario and Quebec.

Over a considerable portion of the Dominion are to be found the following materials, which are or may be used in the manufacture of cement: Argillaceous and pure limestones, magnesian limestone, marl, and clay. Of the limestones, probably the best known in Ontario is that constituting a band about eight feet thick and of Niagara age. This band is quarried along its exposure on the Niagara escarpment between Thorold and St. David in Lincoln County, and consists of a bluish-gray argillaceous limestone overlying black bituminous shales. Again, at Limehouse, in Holton County, the Niagara affords a good cement rock. The band here is nine feet thick and rests upon eight feet of bluish shales. As may be supposed, the shales underlying the cement rock in both the foregoing instances form a very distinct quarry floor, thus minimizing the danger of mixture with inferior rock. At Rynal station, Wentworth County, a similar cement rock is quarried. Many other bands of limestone and magnesian limestone in the Niagara formation in Ontario are known to possess hydraulic properties, though at present no others than those noted are being utilized.

Throughout the Onondaga formation, which is developed in Canada only in Ontario, are many beds of hydraulic cement rock, the best known being those of the Saugeen valley and vicinity and those in the neighborhood of Paris. The lower beds of the Lower Helderberg (Waterlime group) also afford impure magnesian limestones eminently suitable for the manufacture of cement.

In Eastern Ontario, cement is made from an impure limestone found at Napanee Mills, in Addington County, and in the township of Nepean, Carleton County, there is developed a bed of argillaceous magnesian limestone of Chazy age, from which the so-called "Huce cement" is made. An analysis of the crude Nepean rock gave Delesse:—

Carbonate lime	45 30
Carbonate magnesia	12.77
Alumina and iron oxide	12.52
Insoluble argillaceous residue	19.77
Water and loss	9.64
	100.00

In the Province of Quebec natural cement is made in Quebec City from a bluish-black dolomite, and at the Mountain Portage, on the Magdalen River, Gaspe County, is found a black dolomite, which is said to possess strong hydraulic properties. A similar band has also been noticed on the Grande Conde, six miles below Great Pond River, in the same county.

An analysis of the Magdalen River rock gave Delesse:—

Carbonate lime	43.17
Carbonate magnesia	32.12
Alumina with iron oxide	4.10
Insoluble (fine clay)	20.30
	99.69

Many other bands of rock suitable for the manufacture of natural cement are known in Canada, but the foregoing is thought sufficient to illustrate their geographical and geological distribution.

For the making of Portland cement, suitable clays and marls or limestones are found at many places in that juxtaposition necessary for economical and profitable working, mention will therefore be made only of those points whereat works are situated. These are, Hull and Pt. Claire, in Quebec; Napanee Mills, Marlbank, and Ocorn Sound, in Ontario. At Hull, Pointe Claire, and Napanee Mills clay and limestone are used, while at Marlbank and Ocorn Sound the cement is produced from clay and marl, which occur in quantity and of singular purity. Of the materials wherefrom the Ocorn Sound cement is produced the following analyses are available.

Marl.— Analyst, Ed. Chapman, Ph.D., Toronto.

Carbonate lime	96.41
Carbonate magnesia	1.64
Carbonate iron	0.42
Intermixed sand, clay, and organic material	1.16
Moisture	0.37
	100.00

Clay, underlying marl.— Analyst, R. R. Hedley.

Moisture	1.42
Silica	62.26
Alumina	14.70
Ferric oxide	3.22
Lime	5.28
Magnesia	0.63
Carbon dioxide	10.09
Potassium oxide } Sodium oxide }	2.64
	100.24

Of the various manufactured natural cements, the following analyses only are at hand:—

	I.	II.	III.	IV.
Lime	53.55	43.05	39.70	52.49
Magnesia	2.20	18.02	9.56	Traces.
Silica	29.88	28.43	—	27.40
Alumina and iron oxide	12.70	10.50	19.74	12.16
Insoluble argillaceous residue			30.98	
Sulphate lime	1.58	—	—	7.95
	99.91	100.00	100.00	100.00

I. Thorold, by Delesse.
II. Napanee Mills, by W. M. Smith, Syracuse, N Y.
III. Hull, by Delesse.
IV. Quebec, by Delesse.

As to the relative qualities and tensile strength of the various Canadian cements, it has been thought best to say nothing, as "comparisons are odious." Much information and many schedules of testing operations may, however, be found in recent reports of the City Engineers of Toronto and Montreal. In these reports the various Canadian brands are shown in comparison with most of the prominent European and American natural and artificial cements.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Prehistoric Remains in America.

THERE is one fact in regard to the prehistoric and protohistoric remains of North America which does not appear to have received the attention it deserves.

If we examine carefully the descriptions and figures of these remains so far as published and attempt to classify them, we soon find ourselves forced to admit that there are two well-marked, general classes of types, the one belonging to the Pacific and the other to the Atlantic slope. The characteristics which distinguish these two classes are both numerous and well-marked. Geographically, the Rocky-mountain range appears to be the dividing line as far south as the Rio Grande, Mexico, and Central America, belonging to the Pacific slope section.

Although the remains of the Pacific division present many types, varying in the different sections, yet there is such a strong general resemblance, on the one hand, of those found from Southern Alaska south to the Isthmus (excepting a gap in California), and, on the other hand, such a strong contrast with those of the Atlantic slope as to justify the conclusion that this arises from ethnic distinctions and indicates different races. Mr. Swan has long been calling attention to the resemblance between the types of the region inhabited by the Haida Indians and the remains of Mexico and Central America, and no one who will make the comparison will fail to be convinced. Professor Dall, who has studied the manners, customs, and remains of the Northwest Coast, reaches the same conclusion. I cannot enter into details in this brief article, but ask any one who doubts the correctness of this conclusion to compare the figures given by Ensign A. P. Niblack, in his work on "The Coast Indians of South Alaska and Northern British Columbia," with those found on the monuments of Mexico and Central America, and then with the types of the Atlantic slope. It is true that the former are modern, yet the resemblance both in general character and combination to those of Mexico and Central America is too marked to be overlooked, while no such resemblance to those of the Atlantic slope is observable.

Do not these resemblances on the one hand and differences on the other have an important bearing on the question, "From whence did America (or rather North America) derive its original immigrants?" That the works of the two slopes present two distinct classes of types cannot be denied. That there is in California a break in the continuity of the types of the Pacific slope, which seems to indicate an overflow from the Atlantic side, only serves to emphasize the above conclusion. The marked similarity between the types of the Pacific slope and the Pacific Islands has been referred to by Professor Dall (3d Ann. Rep. Bur. Eth., pp. 147-151), who finds that they have prevailed "from Melanesia to Peru and from Mexico to the Arctic." In summing up, he remarks that "the mathematical probability of such an interwoven chain of custom and belief being sporadic and fortuitous is so nearly infinitesimal as to lay the burden of proof upon the upholders of the latter proposition." Professor Dall does not argue from this a common origin of the people possessing these characteristics; but believes they have been "impressed" upon the inhabitants of the western coast from the Pacific side. Notwithstanding this disclaimer, does not the evidence indicate two streams of original immigration, one to the Atlantic and the other to the Pacific coast? Ensign Niblack, although disclaiming any inference to be drawn therefrom as to relationship, gives a list of resemblances between the customs and works of the New Zealanders and Haida Indians that is certainly remarkable.

The idea that America was peopled by way of Behring Straits is somewhat losing its hold on the minds of students, and, as a usual result, there is a tendency to swing to the opposite extreme. Drs. Brinton and Hale are inclined to believe, chiefly from linguistic evidence, that the first settlers came from Europe to the North Atlantic coast. The former says in his "Races and Peoples," pp. 247-248, "Its first settlers probably came from Europe by way of a land connection which once existed over the North Atlantic, and that their long and isolated residence in this continent has moulded them into a singularly homogeneous race, which varies but slightly anywhere on the continent and has maintained its type unimpaired for countless generations. Never at any time before Columbus was it influenced in blood, language, or culture by any other race."

Now it may be that settlers came from Europe to the North Atlantic coast, but the evidence is decidedly against the remainder of the above quoted paragraph, which is, in fact, somewhat self-contradictory. For, if the settlement was at one point, by one race, and this race was never influenced by another, it is difficult to imagine in what respect the moulding process acted. However, the chief objection is to the theory of a single original element, and the assumption that it was never influenced in pre-Columbian times by any other race or element. The facts set forth by Professor Dall and confirmed by Ensign Niblack are too apparent to be set aside by any theory or mere declaration. Even without the evidence presented by these parties, the differences between the archæologic types of the Pacific and Atlantic slope are sufficient to outweigh any argument that has been presented against intrusive elements. CYRUS THOMAS.

Washington, D.C.

Some More Infinitesimal Logic

PROFESSOR BOWSER, in his reply to me in *Science*, Mar. 10, does not recognize the logic of his calculus in the example in question. The only reasons given in his calculus that would permit the use of $\cos dx = 1$ are, the axiom (?), page 12: —

"An infinitesimal can have no value when added to a finite quantity and must be dropped."

And, page 37: —

"Because the *arc dx* is infinitely small, . . . its *cosine* equals 1."

If, for these reasons, $\cos dx = 1$, then, for the same reasons, $\sqrt{2} \cos\left(\frac{\pi}{4} + dx\right) = 1$.

Four out of the five axioms on page 12 are misleading, not to say incorrect. The orders of infinitesimals or infinites to be retained in an expression do not depend upon the expression, but upon the use that is to be made of it. Sometimes we must use $\cos dx = 1 - \frac{dx^2}{2}$ or $= 1 - \frac{dx^2}{2} + \frac{dx^4}{24}$, etc. Quite prominent mathematicians have failed to do this properly in instances where they would naturally use great care. Reasoning on infinitesimals is at best of a slippery character. I have referred in my former article to an example (Ex. 3, p. 325) where Professor Bowser obtains a result that is easily verified to be incorrect; yet the logic of his work seems correct, not only to the average, but to the best students; and it must have seemed right to Professor Bowser, or he would not have inserted it.

The second proof of the differential of the logarithm, pp. 29-31' is another example of false logic. The same proof is found in Olney, p. 25; Taylor, p. 24; Hardy, p. 31; and is the only proof relied upon by some of these authors. This is quite a list of mathematicians who have indulged in infinitesimal reasoning of the value zero, and who will probably learn of it for the first time through this article. It is easily seen that the logic is false by

the fact that it applies step for step when d is replaced by $\triangle$, the finite difference symbol, giving the result $\triangle \log z = m \frac{\triangle z}{z}$, with m independent of z, which is absurd.

I am not opposed to the method of infinitesimals when properly presented. It is logically only an abbreviation of the method of limits, and I should, for my own satisfaction, always want to test new results obtained by it, with the method of limits in full. I should be glad to see Professor Bowser revise his book. There are some good things in it. I trust Professor Bowser and the other authors mentioned will take my criticisms in the spirit they are intended. We are all liable to make mistakes, and if I should indulge in book-writing to any extent, there would no doubt be some sins of that kind of my own commission, especially in the subject of infinitesimals.

A. S. HATHAWAY.

Rose Polytechnic Institute, Terre Haute, Ind., March 16, 1893.

Color of Flowers.

WILL some of the readers of *Science* tell me what to use for preserving the color of flowers when pressing them?

JEANNE NEAL.

Saint Joseph, Mich.

BOOK-REVIEWS.

Extinct Monsters. By REV. H. N. HUTCHINSON, B.A., F.G.S. New York, D. Appleton & Co.

THIS book is, as the author states, a popular account of some of the larger forms of ancient animal life. It is impossible to say too much in favor of the proper kind of popular science. The only argument that scientific research can advance for itself, is that the results of its work will appeal to mankind in general. Scientific investigators must therefore encourage in every possible way all attempts to render science popular and cherish every successful writer in this line. To write popular scientific works is an extremely difficult matter, and there are few in the world who are capable of it. The scientist who is best familiar with the facts is usually either unable to put his facts in a form to be enjoyed by the general reader, or is afraid of losing caste among his friends by doing so. But there is no scientist who does not hail any popular exposition of scientific truth.

There are two faults into which a writer of popular science is liable to fall. If he is too much of a scientist he becomes too technical, and if he is not enough of a scientist he becomes too discursive and too much inclined to fill his pages with rhetorical flourishes. The present book does not fully avoid either of these two faults. At times the reader is led along through a series of rhetorical exclamation points and feels that the author is endeavoring to amuse rather than instruct; and at other times he finds technical terms used which he certainly cannot understand in their proper significance. The book aims to reach those unacquainted with geology, but assumes a knowledge of the succession of geological ages and considerable familiarity with the different strata of rocks. Probably the book would be more instructive if the author had treated his subjects in a little more systematic way, and had not been quite so desirous of introducing popular names on one page to please his non-scientific readers and scientific names on the next page to satisfy his sense of scientific consistency.

But, in spite of the trifling inperfections, it must be stated that this book is an emphatic success as a bit of popular writing. The style is easy and interesting. When one takes up the book, he is inclined to read page after page and chapter after chapter without any desire to lay the book down. The author has skilfully interspersed striking incidents connected with the discovery of special fossil types in such a way as to add vivacity and life to the whole.

The most valuable and interesting part of the whole to all must be the figures in which the book abounds, drawn by J. Smit. These figures are partly skeletons, and represent our present actual knowledge of the hard parts of the extinct monsters as collected in the museums of the world. But the figures which will most appeal to the reader are the restorations of these ancient monsters in the flesh. Of course, restorations of extinct monsters have been made many times, and they have been constantly changed as new facts are discovered. The author would not pretend that his restorations are final, but it can be claimed fairly, and will be easily admitted, that the restorations, as given in the figures of the present book, are the best that have been made up to the present time, and are certainly nearer the truth in each case than those which have preceded them.

One is very naturally inclined to feel, after a cursory reading of this book, that the ancient world was filled with nothing but monsters, and perhaps the author would have given a better picture of ancient life if he had interspersed with his monsters some of the smaller but no less interesting types of animals. But, on the whole, the book is a success as a bit of popular writing, and can be recommended to all.

Advanced Lessons in Human Physiology. By OLIVER P. JENKINS, Ph.D. 60 cents.

Primary Lessons in Human Physiology. By the same author. 30 cents. Indianapolis, Indiana School Book Co.

THESE two little books are published in the Indiana State series of school text-books, and are designed, one for primary schools and the other for advanced schools. One is glad to see a departure from the plan of teaching simple anatomy and the introduction of a physiological basis of treatment. The physiology of man is studied from the standpoint of general biological truth, and the student may here actually learn something of the laws of life.

Interpretation of Nature. By PROFESSOR NATHANIEL S. SHALER. Boston, Houghton, Mifflin & Co. $1.25.

IT is not very common that a person of as much scientific repute as Professor Shaler of Harvard ventures even indirectly to discuss in print the question of the relations of science to theological problems, and for this reason there is especial interest in the pages of this little book. Professor Shaler, in his preface, tells us that his first contact with natural science had the effect of leading him far away from Christianity, but that of late years further insight into the truths of nature have forced him back again towards the grounds from which he had departed. The body of this publication is a discussion of various problems of natural science for the purpose of pointing out how it is that the discoveries of science fail to be in themselves a satisfactory answer to man's questions as to the philosophy of nature. The different chapters of the book are not and do not pretend to be arguments upon the subject of the relation of theology and science. They are rather thoughts upon certain phases of scientific truth and a general inference as to lack of satisfaction which the mind can find if it rests in scientific truths alone. He discusses the general appreciation of nature historically, and then more in detail the general subject of biological evolution, especially in its philosophical aspect. The general conclusion of the whole is as to the lack of a satisfactory foundation for thought in science itself, and the unavoidable feeling which must come to a thoughtful student of some power unknown and lying deeper than the phenomenon which science studies on the surface. Even in regard to the scientific aspect of the doctrine of Christianity, Professor Shaler tells us that "the doctrine of Christ is the summit and crown of the organic series." One cannot but be forcibly reminded of Spencer's grand generalization that scientific fact and religious thought are both truths, and that the final outcome of study is to be a fundamental union of the two.

This book of Professor Shaler's will be especially interesting to two classes of readers. First to those who have passed through somewhat of this same mental history as that which Professor Shaler points out as his own. This will include a body of scientists who had learned to look deeper than the phenomena and to wonder concerning the underlying truths, a class of thinkers which seems to be a growing one at the present time. A second class is the great body of readers who are and always have been in thorough sympathy with religious teachings, and will rejoice to see a scientist of such high standing taking a position so in harmony with the most advanced religious truth. While, on the

other hand, that body of scientific thinkers who repudiate all forms of theological truth will probably fail to have much sympathy with the conclusions reached in these pages. No one, however, who has a thoughtful mind can fail to find much of interest and significance in this trenchent discussion of the interpretation of nature by Professor Shaler.

Formation of the Union, 1750–1822. By ALBERT BUSHNELL HART. New York, Longmans, Green & Co. $1.25.

THIS is the second volume in the series of Epochs of American History, and is by the editor of the series. It is written in an excellent narrative style, clear and bright, and much more carefully finished than the style of most of our younger historians. It is not well adapted for beginners, since it can hardly be understood and appreciated without some previous knowledge of the period it covers. For those who possess such knowledge, however, even in outline, this book will be both entertaining and useful. It is devoted, as the author in his preface remarks, to "the study of causes rather than of events, the development of the American nation out of scattered and inharmonious colonies." Though it embraces the period of the Revolution and the War of 1812, it contains very little military history, the author holding that, though military movements are of great interest to professional soldiers, "the layman needs to know rather what were the means, the character, and the spirit of the two combatants in each case, and why one succeeded where the other was defeated." The causes of the Revolution are set forth with great clearness in a brief space; the true character of the struggle is pointed out; and the reasons for the success of the Americans are made apparent. Then follows a lucid exposition of the difficulties and distresses which showed the necessity of a stronger national government, and of the successful efforts of the wisest leaders in framing and establishing such a government. Professor Hart, however, saw clearly that, though the Union was now formed, it was not yet securely founded; and so he follows its fortunes through the trying periods of Washington's, Adam's, and Jefferson's administrations, and even for many years after. The result is a philosophical view, comprehensive and clear, though necessarily brief, of the formation of the Federal Union and of its early struggles for recognition abroad and security at home. The growth of the national territory from the peace of 1783 to the last acquisition from Mexico in 1853 is shown in a map, and several other maps illustrate other aspects of the period under review. We commend Professor Hart's book to students of American history as an excellent review of an important period.

Proof of Evolution. By NELSON C. PARSHALL. Chicago, Charles H. Kerr & Co.

THIS little book is one of a series of popular lectures given before the Brooklyn Ethical Association. As a popular lecture it was bright, interesting, and instructive, though somewhat flippant and inclined to sacrifice logic for effect. One cannot but regret that the author ever committed it to print. It tries to cover the whole ground of evolution, astronomical, geological, and biological, and all in the course of 60 brief pages. One cannot but have a feeling of dissatisfaction upon reading the book. The subjects are of necessity too briefly treated to be intelligible, and show too frequently a failure of appreciation of the results of recent science. Perhaps the book may have one purpose that the author desires, of making its readers hungry for more, but it certainly cannot give one any adequate idea of the subjects outlined.

AMONG THE PUBLISHERS.

THE Open Court Company of Chicago have published a book by Dr. Paul Carus, entitled "Truth in Fiction." It consists of twelve short stories of various types, and all designed to impress some moral or philosophical lesson, and particularly to illustrate

CALENDAR OF SOCIETIES.

Anthropological Society, Washington.

Mar. 28. — Major John W. Powell, A System of Psychology (continuation of former paper).

Biological Society, Washington.

Mar. 25. — L. M. McCormick, A Hybrid Between Pyranga rubra and Pyranga erythromelas; E. W. Doran, Development of the Intestine of Tadpoles; Theobald Smith, The Bacteriology of Potomac Water and its Bearing on Sanitary Problems; B. T. Galloway, Experiments in Preventing Rusts Affecting Cereals.

Philosophical Society, Washington.

Apr. 1. — O. T. Mason, The Philosophy of Folk-Lore; W. H. Dall, A Miocene Climate in Arctic Siberia; F. H. Bigelow, The Model Globe, Showing the Magnetic Forces that Produce the Diurnal Variations of the Needle.

New York Academy of Sciences, Biological Section.

Mar. 13. — Professor T. D. Quackenbos, in a paper on the Saibling of Lake Sunapee, distinguishes in this a fourth variety of New England charr, demonstrating that the present abundance of this Salvelinus is accounted for not from its introduction and natural increase, but from destruction of inimical forms within recent years, which has given a greater available food-supply. Professor G. S. Huntington, on "Anomalies of Pectoralis major and minor," referred to the value of these as often presenting reversions. He emphasized the evolutionary tendency in man to proximalization of the points of attachment of the shoulder muscle group, referred to cleavage variations in anterior portion of brachio-sphalic sheet, and compared these with ontogenetic characters in anthropoids. Human anomalies in this group are best interpreted by cynocephaloids, and not by the higher forms. Professor E. B. Wilson, "On Regeneration and the Mosaic Theory of Development," presented a brief critique on the latest results of Roux and Weismann.

and enforce the special doctrines of the author. Some of them are directed against philosophical agnosticism, a doctrine for which we have as little respect as Dr. Carus has; another shows the folly of the antagonism between laborers and their employers; while still another, which we cannot regard as very successful, illustrates the author's disapproval of utilitarian ethics. The best of them all are those in which some distinctly moral lesson is drawn, especially "The Chief's Daughter," which tells how a certain tribe of savages were led to abandon the custom of human sacrifices, while at the same time it shows the moral superiority of the spirit of man over the blind forces of nature. We do not agree with all of Dr. Carus's views, but we are always pleased with the moral earnestness and the desire to be useful which characterize all his works.

— Students of American geology and paleontology are well aware of the importance of the Memoirs of T. A. Conrad on the Tertiary Fossils of the United States. These memoirs are practically out of the market, very few copies exist even in private libraries; while few of the fossils figured in them are figured elsewhere. Mr. Gilbert D. Harris, at the Smithsonian Institution, is projecting a reprint of the Eocene or earlier volume, and it has been thought that the more extensive and later Miocene monograph might appropriately be issued by the Wagner Free Institute of Science, Philadelphia, provided a sufficient number of subscriptions shall be received to measurably cover the expense. It is proposed to reprint the text of the "Medial Tertiary" (about 100 pages) verbatim; to reproduce the original plates by a process of photo-engraving, and to insert a brief introductory chapter and a table showing the present state of the nomenclature of the species contained in the work; the whole forming a volume in octavo of about 150 pages with 49 plates. It is obvious that all libraries of reference and students of geology and paleontology will find the work indispensable; and it is hoped that the response will be such as to render it practicable to undertake the reprint without delay. Professor Wm. H. Dall, Paleontologist to the U. S. Geological Survey, has consented to supervise the reprinting, with the collaboration of Mr. Gilbert D. Harris, and to supply an introduction. If subscriptions can be obtained for 150 copies, at $3.50 each, including postage, the work will be undertaken, although that amount will not repay the expense of the publication. Subscriptions may be addressed to the Wagner Free Institute of Science, Philadelphia, Pa.

— Charles L. Webster & Co. have published a new work by Henry George, in which he criticises Herbert Spencer's utterances on the land question. It is entitled "A Perplexed Philosopher," and assails Mr. Spencer for having changed his views without adequate reason. In his work on Social Statics, which he wrote in early manhood, Mr. Spencer maintained essentially the same theory about property in land that Mr. George holds now; but in his later writings he has repudiated that theory, and now advocates the system of individual property in land as in everything else. Mr. George is able to show that some of his opponent's reasons for his change of view are not conclusive; but he goes much further and charges him with intellectual dishonesty and with the desire to curry favor with the British aristocracy. We don't believe, however, that Mr. George's charges will find acceptance except with the fanatical advocates of his own doctrines; for Mr. Spencer's change of view admits of a much more reasonable explanation. He has been for many years the staunchest upholder of individualism in all its forms and a violent opponent of socialism and of all efforts to extend the influence of the State; and it is obvious that the advocate of such doctrines could not long continue to favor the communal ownership of land. Mr. George's criticisms are incisive, and, as we have remarked, some of them are well taken; but we doubt if his book will change any man's views on the question in controversy, or help in the least to make his own doctrines more acceptable.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

For sale—A Zentmayer new model U. S. Army Hospital monocular stand. Price $110, will sell for $75. Address H. C. Wells, No. 151 Broadway, New York.

For sale—A complete set of the third series of the American Journal of Science (1870-1888) handsomely bound in single volumes in dark brown half morocco. Address G. H. Williams, 808 Cathedral Street, Baltimore, Md.

For sale, or for exchange for books on medicine or surgery, new editions only, a large geological library, containing nearly all the State and Government Reports since 1855. Will be pleased to answer letters of inquiry and give information. Address R. ELLSWORTH CALL, Louisville, Ky.

For exchange.—Slides of Indian Territory Loup Fork Tertiary Diatoms for other microscopic fossils. Address S. W. WILLISTON, Univ. of Kansas, Lawrence, Kans.

For exchange.—Will exchange an "Ideal" Microscope of R. and J. Beck, London, 2 eye pieces 3 objectives, 3 inch, 1 inch, 1-6 inch; bull's eye condenser on stand, substage condenser, mechanical stage, etc., for any of the leading makes of type writers. Particulars by mail. DELOS FALL, Albion College, Albion, Mich.

Sale, or exchange for similar material; Diatoms (Isthmia nervosa), unmounted, from San Francisco Bay. M. J. ELROD, Bloomington, Ill.

For sale or exchange.—I have a few copies of my translation of "Strasburger's Manual of Vegetable Histology, 1887," now out of print, which I will send post-paid for $3 or for one dozen good slides illustrating plant or animal structure. Address A. B. Hervey, St. Lawrence University, Canton, N. Y.

The undersigned has the following specimens to exchange for crystals of any eastern or foreign localities or Indian relics: tin ore, metacinnabarite, stibnite, garnierite, calenanite, hanksite, ulexite, rubellite, lepidolite, blue and green onyx, Cal. pineite, aragonite on chalcedony, cinnabar, double refracting spar, clear and clouded, and others. J. R. Bush, care of General Delivery, Los Angeles, Cal.

For sale or exchange.—A private cabinet of about 200 species of fossils, well distributed geologically and geographically. Silurian, about 40; Devonian, about 50; Carboniferous, about 80; others, about 30. Frank S. Aby, State University, Iowa City, Ia.

Wants.

THE undersigned desires specimens of North American Gallinae in the flesh for the study of their pterylosis. These species are especially desired: *Colinus ridgwayi, cyrtonyx montezumae, deudragapus franklini, lagopus welchi, tympanuchus cupido* and *pedioecetes phasianellus*. Any persons having alcoholic specimens which they are willing to loan or who can obtain specimens of any of the above are requested to communicate with Hubert Lyman Clark, 3922 Fifth Avenue, Pittsburgh, Pa.

WANTED—Second-hand copy Tryon's Systematic Conchology. Please quote condition, date, price. H. L. Osborn, Hamline University, St. Paul, Minn.

A COMPETENT TEACHER of botany in college or university is open to engagement. Address L., Box 86, Rochester, Mich.

CAN any one inform me as to the age to which cats have lived? I have one twenty years old. Edward D. Webb, 182 W. Eighty-first St., New York.

WANTED — Second-hand. Foster's Physiology, Balfour's Comparative Embryology, Claus & Sedgwick's Zoology, Flower's Osteology of Mammalia, Vine's Physiology of Plants. Please state editions and prices asked and address Richard Lees Brampton, Ontario, Canada

WANTED.—American Journal of Conchology, seven volumes. Parties having these for sale will please address the undersigned, stating condition and price. R. Ellsworth Call, Louisville, Ky.

A GRADUATE ENGINEER will give instruction evenings in geometry, trigonometry and surveying, mechanics, physics, mechanical drawing and general engineering construction. Five years' experience in field and editorial work on engineering journal. References furnished. C. S. H., 102 Tribune Building, New York.

WANTED.—By well-qualified and experienced science master and associate of the Royal School of Mines, London, aged 26 (at present in England), a mastership in technical college or university for any of the following subjects: Engineering sciences, geology and mineralogy, physics, chemistry and metallurgy, etc., etc. Can provide excellent references and credentials. Apply, J. G., 17 Sussex St., Rochdale, England.